Rediscovery of the Large Desert Sminthopsis (*Sminthopsis psammophilus* Spencer) on Eyre Peninsula, South Australia

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INTRODUCTION

Sminthopsis psammophilus, The Large Desert Sminthopsis, (Plate 1) was originally described from a unique specimen taken in 1894 amongst porcupine grass tussocks on the sand-ridge desert near Lake Amadeus in the Northern Territory of Australia. The single example was captured by Mounted Trooper E. C. Cowle, then stationed at the Illamurta Police Post, and presented to members of the Horn Scientific Expedition to Central Australia, for whom he was acting as guide. Subsequently in 1895, the specimen was described as a new species by Sir W. Baldwin Spencer, then Professor of Zoology at Melbourne University. For 75 years no further example was discovered and the species was feared to be extinct.

REDISCOVERY

On 28 February, 1969, a second specimen was captured by Mr. Mervyn Andrews, a cereal farmer, on his property at Section 10, Hundred of Mamblyn, Eyre Peninsula, South Australia; approximately 650 miles south-east of the Type locality. The capture area, situated in a zone of 12-14 inch rainfall, features a topography of roughly parallel sand-dunes, between 20 and 40 feet in height, separated by wide interdune valleys. Originally the system had a fairly uniform covering of mallee-broombush vegetation with sparse ground cover. Mallees (*Eucalyptus* spp.) tended to predominate in the valley flats, but became more heavily admixed with broombush (*Melaleuca uncinata*), plus other herbaceous and ephemeral plants, on the dunes. Examples of native cherry (*Exocarpus sparteus*) and native pine (*Callitris canescens*) occurred sporadically throughout, and semi-open areas of porcupine grass (*Triodia lunata*) appeared intermittently on the dune slopes. In recent years however, considerable acreages of natural scrub have been cleared from the inter-dune valleys and the land developed for cereal growing. The sand-dune vegetation, on the other hand, has remained largely intact, or has been permitted to regenerate following initial logging and burning activities.

The Large Desert Sminthopsis was taken in daylight, while escaping from a blazing porcupine grass tussock, growing at the base of a re-vegetated dune adjacent to a cleared inter-dune valley. Clearing of both dune and valley had been completed 3 years previously, but the developed valley paddock had remained fallow during this period. The capture spot was at the extreme corner of the paddock, which itself represented the limit of clearing. Ten yards beyond, the dune vegetation continued in a virgin state and the inter-dune valley remained uncleared, although the

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under-shrub had been degraded by sheep grazing.

Following presentation of the Mamblyn specimen to the South Australian Museum, the area was immediately examined by the Author with members of the South Australian Field Naturalists Society Mammal Club. The search failed to reveal either additional examples of the Large Desert Sminthopsis, or further data on the habits of the species. Numerous Mitchell's Hopping-mice (*Notomys mitchelli*) were collected nearby however, and introduced house-mice (*Mus musculus*) were found to be abundant throughout the surrounding district.

As a result of this failure, an intensive campaign for more specimens was initiated throughout northern Eyre Peninsula, and, on 23 April, 1969, Mr. Dennis Eichner, a clearing contractor of Bailey Plains, collected four further specimens while logging and burning mallee-broombush scrub on Section 45, Hundred of Boonerdoo. This area was of identical topography and vegetation to the Mamblyn locality, but situated some 50 miles to the south-east. One of Mr. Eichner's specimens subsequently escaped, but the remainder were deposited in the South Australian Museum.

Discovery of the Boonerdoo colony not only confirmed that the Large Desert Sminthopsis was a viable species of Eyre Peninsula, but provided additional evidence that mallee-broombush scrub with porcupine grass, was a preferred habitat. The discovery served also to allay fears that the species would disappear again soon after rediscovery. Such could well have been the case at Mamblyn, where clearing of the habitat is proceeding rapidly. At Boonerdoo, on the other hand, all four specimens were collected from an area immediately adjacent to the Hambidge Wildlife Reserve, where the topography and vegetation is essentially the same as that of the capture locality. It is reasonable to assume therefore, that the Large Desert Sminthopsis is represented on the reserve, where, with proper management, its chances of survival are good.

Plate 1.
Sminthopsis psammophilus,
Mamblyn,
South Australia.

(Photo by Roman Ruehle).

NOMENCLATURE

Sminthopsis psammophilus Spencer, 1895, Proc. Roy. Soc. Victoria, new ser., 7: 223.

1896, Report on the Horn Sci. Exped. to Central Australia, 2 (Zool.): 35-6, pl. 1, fig. 2, 2a-b.

Sminthopsis macrura psammophila Tate, 1947, Bull. Amer. Mus. Nat. His. 88 (3): 123.

Sminthopsis psammophila Troughton, 1964, Proc. Lin. Soc. New South Wales, 89 (3): 317.

MATERIAL

The original description of *Sminthopsis psammophilus* included no cranial details, since it was based on a single spirit preserved specimen with the skull *in situ*. An expanded account of the species is appended, based on the Holotype in the National Museum of Victoria: no. C6203, adult ♂, (spirit body with skull now removed) "Sand Hills near Lake Amadeus C.A., 1894, E. C. Cowle". Plus 4 specimens from the South Australian Museum: nos. M7662, adult ♂, (puppet skin and skull) Sec. 10, Hundred of Mamblyn, S.A., 28 Feb. 1969, M. Andrews; M7663, adult ♂, (spirit) M7971 and M7972, adult ♀ ♀, (puppet skins and skulls) Sec. 45, Hundred of Boonerdoo, 23 Apr. 1969, D. Eichner.

Pelage colour nomenclature follows the standards of Ridgeway, (1912) and all measurements are in millimetres with the terminology, unless otherwise stated, after Cockrum (1955). Skull measurements were made with Helios dial calipers under a binocular microscope. Flesh dimensions were obtained from fresh material in the case of South Australian Museum specimens and from a spirit preserved specimen in the case of the Holotype (Spencer, 1895 *op. cit.*).

FIELD IDENTIFICATION

An exceptionally large and robust *Sminthopsis*, clearly recognisable from other members of its genus by the laterally thin, dorso-ventral, feather-like crest of stiff hairs on the distal quarter of the tail (Plate 2).

EXTERNAL FEATURES

Dorsally the fine, dense fur is approximately 14 mm. long, of which the basal 10 mm. are dark mouse grey, the medium 3 mm. are drab grey and the terminal 1 mm. is fuscous black. Interspersed with the fur are spines 18 mm. long, of which the basal 8mm. are dark mouse grey and the thickened, apical 10 mm. are fuscous black. The back is thus imparted with a drab, brindled appearance that is continued forward on the head in a wedge shaped patch with its apex between the eyes. Elsewhere on the dorsal surface of the head, the fur is shorter and more bristly, with less pronounced fuscous black tips and fewer spines, giving a lighter, less brindled effect. A fuscous black ring of hair is present around the eye.* Mystical vibrissae number approximately 25 on each side, are up to 35 mm. in length and are predominently fuscous black. Other vibrissae per side are: orbital, 2, fuscous black; facial, 2, fuscous black; and carpal, 2, white.

On the cheeks, flanks, shoulders, hips and thighs, the fuscous black tips of the fur are markedly reduced, the median shaft colour alters to vinaceous buff, and spines are vir-

*"Spencer was in error in his 1896 account of the Holotype in which he stated—"There is a white line of hairs around the eye". Subsequent examination of the Holotype revealed no trace of such a feature, nor was it apparent in any of the fresh material to hand.

tually absent. A pronounced vinaceous buff colouration is thereby produced in these areas.

The membranous, ovate ear has a well developed, rounded tragus, 3.5 mm. long, by 3 mm. wide, an anterior fringe of vinaceous buff and white hairs, and an antero-external patch of fuscous black bristles. The remainder of each ear is sparsely covered, inside and out, with short, white bristles.

Ventrally the fur is fine, with no spines, and is approximately 10 mm. long, of which the basal 4 mm. are dark mouse grey and the apical 6 mm. are white. On the chin the fur is sparse, short and white throughout.

Both fore and hind feet are clothed with short, white hairs extending to the bases of the pads on the fore-foot and covering the sole of the hind-foot, except for the pads plus a bare, median area of fuscous black, granular skin, which extends forwards from 3 mm. behind the base of the hallux to the bases of the interdigital pads. Apart from this latter area, the soles and pads of both fore and hind feet are ivory yellow in colour. The fore-foot is approximately 4.5 mm. broad and has six semi-coalescent pads, of which three are interdigital; one is at the base of the first digit, and two are plantar. Each pad is covered with uniform, fine granulations, and is surmounted by a smooth, enlarged granule, equal to two granulations in size. The hind foot is approximately 5 mm. broad across the bases of the digits and has three interdigital pads, of which the most external is horseshoe-shaped. No hallucal pad was discerned. Each interdigital pad is covered with uniform, fine granulations and surmounted by a longitudinal row of smooth, enlarged granules, four or five in number, each granule being approximately equal to two granulations in size.

The tail is extremely muscular and tapers towards the tip, but has no sign of secondary fattening or basal incrassation. It is tri-coloured and covered with stiff hairs 3 mm. long. Dorsally the colour is brindled, drab grey with vinaceous buff toning; laterally it is pale smoke grey and ventrally it is fuscous black. On the

Plate 2.
Sminthopsis psammophilus showing details of the diagnostic tail crest.

(Photo by Roman Ruehle)

distal quarter of the tail a laterally thin, dorso-ventral, pennate crest of stiff hairs is present. These hairs are from 4-5 mm. in length and coloured fuscous black in two specimens; drab grey with fuscous black tips in two others; and vinaceous buff with fuscous black tips in the fifth specimen. Dorsally the crest is approximately 25 mm. long and is weakly developed, ventrally however, it is some 30 mm. long and strongly developed with densely packed, erect hairs.

Table 1 provides data on the flesh dimensions from all known specimens of *Sminthopsis psammophilus*. Spencer, 1895 (*op. cit.*) when tabulating the tail measurement in his original description of the Holotype, stated: "Very tip broken off". I calculate that approximately 5 mm. are missing.

TABLE 1

Flesh Dimensions of *Sminthopsis psammophilus*

Measurement	Holotype ♀ C6203 Lake Amadeus (Ex. Spencer)	M7662 ♂ Mamblyn	M7663 ♂ Boonerdoo	M7971 ♀ Boonerdoo	M7972 ♀ Boonerdoo
Body length	105	114	112	91	91
Tail length	116 (Very tip broken off)	129	114	116	126
Length of hind foot (*s.u.*)	25	26	25.7	25.2	25.5
Height of ear (from notch)	24.5	26.8	25.1	23.1	23.3

SKULL CHARACTERS

An elongate skull, with an exceptionally high crowned cranium, produced by the exaggerated, bulbous inflation of the anterior portions of the parietals. This results in a diagnostic cranial depth of at least 12 mm. (Plate 3).

Nasals attenuate, tapering slightly towards the front from a minimal, postero-lateral expansion. Post-orbital processes poorly defined as broad, blunt points without constrictions behind. Sagittal crest minute, but noticeable on the posterior third of the median parietal suture. Lambdoidal crests of similar appearance. A pair of supplementary palatal openings between M4-4. Alisphenoid bullae fractionally less inflated in proportion to skull length than those of *S. crassicaudata* (genotype species). In comparison with adult skulls of *S. crassicaudata* in the South Australian Museum, the ratio for greatest length of skull to greatest breadth of alisphenoid bulla of *S. psammophilus*, compared with *S. crassicaudata*, is 1.06:1. The periotic bullae appear slightly more swollen than those of *S. crassicaudata*, due to the absence of median longitudinal depressions.

Dental formula, $I\frac{3}{3}$: $C\frac{1}{1}$: $P\frac{3}{3}$: $M\frac{4}{4}$. Teeth, upper jaw; I^1 prominent, set apart from I^{2-3}, which are smaller and increase in size to the rear by crown length, but not crown

height. C^1 more than twice as high as I^3 and separated from it by a diastema of approximately 1 mm. Minute posterior cingula are present on the canines of two out of the four specimens examined. $P^{1, 3, 4}$ well spaced, not separated by a diastema from the canine, and increasing evenly in size to the rear by both crown height and crown length; P^1 being approximately half the size of P^4. Small anterior and posterior cingula are normally present on all premolars, but vary considerably in development. In one specimen examined, both cingula were apparently absent from P^{1-1} and were particularly distinct on P^{3-3}. Molars high cusped.

Lower jaw: I_1 not set apart from I_2 and fractionally superior to it in both crown height and crown length.

Plate 3A.
Skull of *Sminthopsis psammophilus*: Dorsal view of cranium and upper jaw.

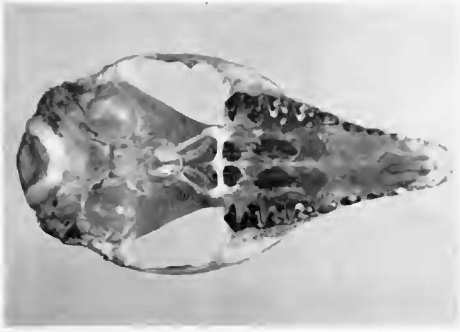

Plate 3B.
Skull of *Sminthopsis psammophilus*: Ventral view of cranium and upper jaw.

(Photos by Roman Ruehle).

I_1 smaller than I_2 in crown height, but greater than either I_1 or I_2 in crown length, through the possession of a minute postero-labial cusp. C_1 approximately twice as high as I_2, with a small posterior cingulum, and not separated from I_{1-3} by a diastema. $P_{1,2,4}$ well spaced, with no diastema between P_1 and the canine. In general P_1 and P_2 are of approximately equal dimensions, although P1-1 are noticeably smaller in one specimen examined. Both P_1 and P_4 are inferior in size to P_3. All premolars possess small anterior and posterior cingula. Molars high cusped.

Table 2 provides data on the cranial and dental dimensions from the Holotype and three other skulls of *Sminthopsis psammophilus*, all hitherto undescribed.

Plate 3C
Lateral view of cranium and upper jaw.

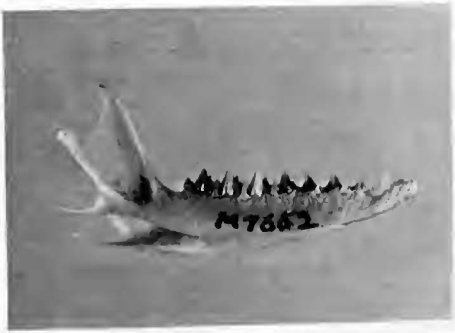

Plate 3D
Lateral view of mandible.

(Photos by Roman Ruehle)

TABLE 2

	Holotype ♂ C6203 L. Amadeus	♂ M7662 Mamblyn	♂ M7971 Boonerdoo	♂ M7972 Boonerdoo
Greatest length of skull (from anterior tip of premaxilla)	—	34.9	32.5	33.3
Basilar length	30.3	30.4	27.8	28.9
Zygomatic breadth	18.0 (cal.)	17.8	17.3	17.6
Cranial breadth	13.7	13.7	13.3	14.0
Least interorbital constriction	6.3	6.7	6.4	6.2
Rostral breadth	4.7	4.5	4.5	4.4
Greatest width across upper molars	11.0	11.2	10.6	10.6
Depth of cranium	12.3	12.2	12.0	12.0
Palatilar length (inc. spine)	18.3	18.2	17.1	17.5
Greatest breadth of alisphenoid bulla	5.3	5.0	4.9	5.0
Length of incisive foramina	4.6	4.4	4.1	4.0
Length of anterior palatine foramina	4.8	4.6	4.4	4.6
Length of posterior palatine foramina	1.4	1.6	1.5	1.4
Width of posterior palatine foramina	1.6	1.8	1.8	1.7
Length of nasals	12.7 (cal.)	13.0	12.0	13.0
Greatest width of nasals	2.9	2.6	2.8	2.6
Dorsal length of pre-maxilla	6.7 (cal.)	8.8	7.6	8.2
Length of mandible (exc. teeth)	—	25.9	24.2	24.8
Crown length of I^1	1.0	0.9	0.8	0.7
Crown length of I^{2-4} (Inc.)	2.05	2.25	2.3	2.25
Crown lengths of $P\frac{1}{1}$	1.4	1.4	1.5	1.4
	—	1.4	1.5	1.5
$P\frac{3}{3}$	1.8	1.8	1.8	1.7
	—	1.8	1.8	1.8
$P\frac{4}{4}$	1.9	1.9	1.9	1.9
	—	1.7	1.65	1.7
Crown heights of $P\frac{1}{1}$	—	1.0	1.1	1.0
	—	1.1	1.05	1.05
$P\frac{3}{3}$	—	1.4	1.4	1.2
	—	1.5	1.4	1.3
$P\frac{4}{4}$	—	1.9	1.85	1.5
	—	1.4	1.3	1.1
Crown length of M^{1-3} (Inc.)	6.2	6.4	6.5	6.5
Crown length of M^{1-4} (Inc.)	7.1	7.4	7.5	7.5

Skull Dimensions of *S. psammophilus.*

SPECIFIC RELATIONSHIP

Tate, (*op. cit.*) in the only modern attempt to evaluate phylogenetic relationships in the genus *Sminthopsis*, separated the known species into two divisions. A "primitive" division characterised by striated foot-pads and P^4 very large with P^1 (and sometimes P^3) considerably reduced; and a more "advanced" division comprising forms with granulated foot-pads, no extreme enlargement of P^4, and P^1 subequal to P^3. Tate also stated that those species in the "primitive" division possessed strongly built skulls with well formed, low sagittal crests and relatively small bullae; and that for those species in the "advanced" division, the defining characters could be accompanied variously, by partial coalescence of individual foot-pads, narrowing of the feet, caudal incrassation and enlargement of the ears and bullae.

Troughton, (*op. cit.*) pointed out that members of the *Sminthopsis*

murina complex, included by Tate in his "primitive" division, do not possess striated foot-pads. Nevertheless under Tate's defined arrangement, *S. murina* could hardly be transferred to the "advanced" division, due to its enlarged P^4, relatively small bullae and low sagittal crest. A number of other anomalies are apparent in Tate's arrangement. *S. frogatti* for example, (=*S. frogatti* and *S. larapinta* of Tate) included in the "advanced" division, possesses granulated foot-pads, moderately large ears and an inerassated tail, but has relatively small bullae, a low sagittal crest and an enlarged P^4. Similar difficulties occur with *S. hirtipes*, which has large ears, specialised, coalescent, granulated foot pads, and huge bullae, but an exceptionally large P^4 and a reduced P^4.

It is thus apparent that the combination of characters defined by Tate do not separate the species of Sminthopsis into clear phylogenetic divisions, nor, in fact, should such divisions be considered realistic until the characters of the genus have been re-examined within a broader family and palaeontological context, to determine which are primitive, which are generalised and which are derivative. In view of this no attempt has been made to place *Sminthopsis psammophilus* in a phylogenetic position within the genus.

Ride, (1970) however, in a popular account of *Sminthopsis* divides the genus for convenience into two sections: those with fat tails and those with thin tails. Under such an arrangement *Sminthopsis psammophilus* falls naturally into the thin-tailed section, where it may be placed adjacent to *S. murina*, with which it shares a distinct similarity of foot-pad structure, dental development and overall cranial conformation.

References

Cockrum, E. L., 1955. *Manual of Mammalogy*. Burgess. Minneapolis.

Ride, W. D. L., 1970. *A Guide to the Native Mammals of Australia*. Oxford University Press. Melbourne.

Ridgway, R., 1912. *Colour Standards and Colour Nomenclature*, author's publication, Washington.

Acknowledgements

I am particularly indebted to Mr. Mervyn Andrews of Mamblyn, Mrs. J. Luscombe of Kyancutta, Mr. Dennis Eichner of Bailey Plains and Pastor Ivan Wittwer of Cleve, without whose co-operation the recent material of *Sminthopsis psammophilus* would never have reached the South Australian Museum. I am also extremely grateful to Mr. John McNally, Director, and Miss Joan Dixon, Curator of Vertebrates at the National Museum Victoria, for allowing me to examine the Holotype.

CORRECTION

"In *Vict. Nat.* **88:** 74 (March 1971), under *Exhibits, Sraevola* sp. aff. *linearis* is mentioned as a new record for Victoria, being found near Annuello. Further, more complete material, of this plant has now been received at the National Herbarium, and full examination shows that the identification given above is incorrect. The Annuello material and also some from Hattah Lakes National Park, should be placed with *S. aemula*. In Victoria this species is more commonly known from southern and eastern localities."